MISTIK MANAGEMENT LTD.

2019 20-YEAR FOREST MANAGEMENT PLAN

Volume II Document V- Modeling Assumptions

Background Information Document

2019 FOREST MANAGEMENT PLAN – VOLUME II MODELING ASSUMPTIONS DOCUMENT

for the

Mistik and L&M Forest Management Agreement (FMA) Areas

For the 20-year period from April 1, 2019 to March 31, 2039

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Changes Since Previous Submission

This document was previously submitted to Saskatchewan Ministry of Environment on October 24, 2017. The only changes from the version submitted on that date to this current and final version are listed below.

Section	Page	Change
N/A	N/A	Headers (changed to "2019 Modeling Assumptions")
N/A	2	Changed date: April 1, 2019 to March 31, 2039
N/A	3	Removed sign-off sheet and added this description of changes
N/A	N/A	Footers (changed to dates)
N/A	N/A	Changed footnotes: date changed from "2017…." to "2019…"
N/A	N/A	Changed throughout document any reference to "2017…." to "2019…"
2	11	Removed the word “District” from planning unit names
6	25 & 26	Changed “district” to “planning unit”

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1. INTRODUCTION

As outlined in the Saskatchewan Forest Management Planning Document, a key component of a 20-Year Forest Management Plan (FMP) is the Wood Supply Analysis (WSA). The primary goal of the wood supply analysis is to determine an Annual Allowable Cut (AAC) level that provides the desired flow of forest values and achieves the desired future forest state. The intent of this document is to outline the key assumptions and inputs that Mistik Management Ltd. and L&M will use in the WSA for the 2019 Twenty-year FMP.

Mistik and L & M will make use of the best available information during the FMP development including the forecasting of wood supply and associated forest estate modeling. In the process of identifying and using the best available information as inputs for the WSA, two supporting documents have been produced and submitted to Saskatchewan Environment Forest Service, including:

- Forest Characterization (2016) – Documents the data used and process followed to characterize the forest and determine the portions of the Mistik and L&M FMA areas that are considered productive and are modelled as part of the WSA.
- Forest Development (2016) – Documents the data used and process followed to determine development types and yield curves used in the WSA for the portions of the Mistik and L&M FMA areas that are identified as Net Productive Area as described in the Forest Characterization document.

2. FOREST CHARACTERIZATION

The following section outlines the landbase characterization categories developed in the forest characterization process. For more information on the development of the categories please refer to the Forest Characterization document. The area in each characterization category and the net productive forested area age class distribution by overstorey species group category are presented for the Mistik and L&M FMA areas in Table 2-1, Figure 2-1, and Figure 2-2.

TABLE 2-1 FOREST CHARACTERIZATION SUMMARY BY FMA AREA

LANDBASE CATEGORY	MISTIK AREA (HA)	L&M AREA (HA)	TOTAL AREA (HA)
Gross FMA Landbase Area	**1,809,288**	**69,211**	**1,878,499**
Water (Lakes and Rivers)	74,535	223	74,758
Landuse Dispositions (Recreation Areas and Timber Reserves)	6,767	0	6,767
Non-Forested: Anthropogenic	11,999	697	12,696
Non-Forested: Natural	149,638	2,953	152,591
Sub-Total (Permanent Exclusions)	*242,939*	*3,873*	*246,812*
FMA Managed Forested Area	**1,566,349**	**65,338**	**1,631,687**
Watercourse Buffers - 15 m	18,316	1,031	19,347
Watercourse Buffers - 30 m	5,814	107	5,921
Watercourse Buffers - 90 m	32,506	0	32,506
Inoperable	253	0	253
Operational Constraints - Low Productivity Class	111,511	332	111,843
Operational Constraints - Low Crown Closure	121,816	2,158	123,974
Operational Constraints - High Larch Component	175,096	0	175,096
Operational Constraints - Significant Disease on Pine	6,928	0	6,928
Operational Constraints - Black Spruce Considerations	276,824	484	277,308
FMA Net Productive Area	**817,284**	**61,226**	**878,510**
Forest Management Modification Area	0	0	0
Sub-Total (Partial Exclusions)	*749,064*	*4,112*	*753,176*
FMA Net Productive Area – No Constraints	**817,284**	**61,226**	**878,510**

FIGURE 2-1: NET PRODUCTIVE AREA AGE CLASS DISTRIBUTION BY OVERSTOREY SPECIES GROUP: MISTIK FMA

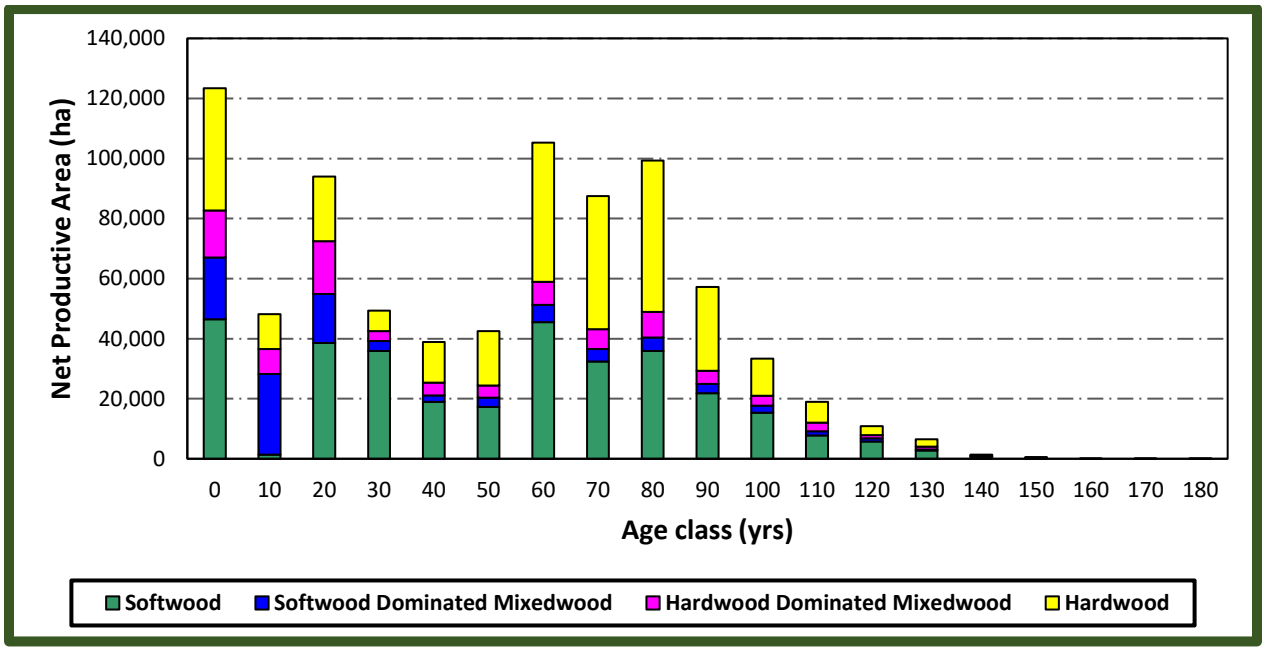
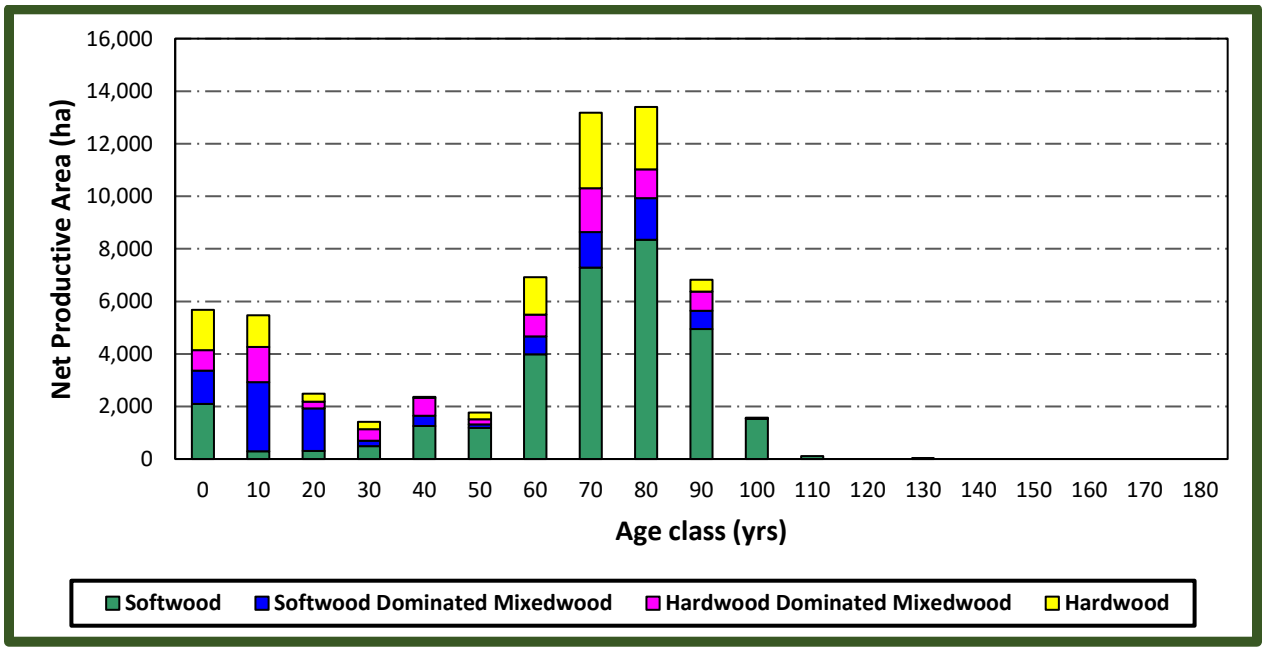


FIGURE 2-2: NET PRODUCTIVE AREA AGE CLASS DISTRIBUTION BY OVERSTOREY SPECIES GROUP: L&M FMA



2.1. MODELLED LANDBASE DETERMINATION

For the WSA it was required to develop a landbase which would be utilized within the WSA model. The landbase that will be utilized within the model will include the net productive areas of both the Mistik and L&M FMAs along with the eligible exclusions, consistent with the process agreed to and followed for the 2007 FMP. The eligible exclusions include forested areas that are in buffers and operational constraints. Table 2-2 provides a breakdown of the area included within the model.

TABLE 2-2 MODELLED LANDBASE AREA SUMMARY BY FMA

LANDBASE CATEGORY	MISTIK AREA (HA)	L&M AREA (HA)	TOTAL AREA (HA)
FMA Net Productive Area	**817,284**	**61,226**	**878,510**
Dispositions	4,817	0	4,817
Watercourse Buffers - 15 m	8,170	636	8,807
Watercourse Buffers - 30 m	3,503	52	3,555
Watercourse Buffers - 90 m	20,770	0	20,770
Inoperable	243	0	243
Operational Constraints - Low Crown Closure	68,868	1,100	69,968
Operational Constraints - High Larch Component	23,669	0	23,669
Operational Constraints - Significant Disease on Pine	6,928	0	6,928
Operational Constraints - Black Spruce Considerations	0	4	4
Total Eligible Exclusions	136,970	1,792	138,762
Modelling Landbase Area	**954,254**	**63,018**	**1,017,272**

2.2. PLANNING UNITS

The FMA area will be managed or will be presented in the 2019 FMP within the context of five planning units, consisting of a total of twelve landscape-level management units ranging in size from 13,706 ha to 355,677 ha. The management units were combined into larger planning units. Table 2-3 identifies the larger planning units, the management units that are within each planning unit, and respective areas (ha) comprising the current Mistik FMA area. The average management unit size is 152,700 ha. On average, only 47% (ranging from 31% to 71%) of the Mistik FMA area is considered capable of supporting timber harvesting. Each management unit within the FMA area is subdivided into many operating areas. There are 416 operating areas comprising the Mistik FMA area with an average size of ~4,400 ha (Table 2-4). The L&M FMA area is subdivided into 10 operating areas and the FMA area is 88% productive.

TABLE 2-3 PLANNING UNIT PRODUCTIVE AREA SUMMARY

Planning Unit	Management Unit	Gross Area (ha)	Net Productive Area	% Productive
West	20-Beaver River	13,706	8,044	59%
	03-Big Island Lake	37,926	26,751	71%
	12-Murray Bay	62,412	37,166	60%
	02-Pierceland	119,855	65,597	55%
Subtotal		233,899	137,558	59%
Central	09-Ile a la Crosse	112,426	34,464	31%
	10-Buffalo	125,665	50,060	40%
	07-Beauval	149,212	53,693	36%
	04-Waterhen	186,515	106,428	57%
	08-Canoe Lake	189,585	60,688	32%
Subtotal		763,403	305,333	40%
North	21-Peter Pond	283,956	102,578	36%
	11-Dillon	355,677	172,488	48%
Subtotal		639,633	275,066	43%
Divide	01-Divide	160,128	99,326	62%
Subtotal		160,128	99,326	62%
L&M	85- L&M	69,211	61,226	88%
Subtotal		69,211	61,226	88%
Total		**1,866,274**	**878,510**	**47%**

TABLE 2-4 PLANNING UNIT AND OPERATING AREA SUMMARY

Planning Units	Management Unit	Gross Area (ha)	# of Operating Areas	Average Op. Area Size (ha)
West	20-Beaver River	13,706	4	3,426
	03-Big Island Lake	37,926	8	4,741
	12-Murray Bay	62,412	16	3,901
	02-Pierceland	119,855	31	3,866
Subtotal		233,899	59	3,964
Central	09-Ile a la Crosse	112,426	27	4,164
	10-Buffalo Narrows	125,665	29	4,333
	07-Beauval	149,212	34	4,389
	04-Waterhen	186,515	45	4,145
	08-Canoe Lake	189,585	29	6,537
Subtotal		763,403	164	4,655
North	21-Peter Pond	283,956	35	8,113
	11-Dillon	355,677	113	3,148
Subtotal		639,633	148	4,322
Divide	01-Divide	160,128	45	3,558
Subtotal		160,128	45	3,558
L&M	85-L&M	69,211	10	6,921
Subtotal		69,211	10	6,921
Total		**1,866,274**	**426**	**4,381**

3. FOREST DEVELOPMENT

3.1. YIELD CURVES AND DEVELOPMENT TYPES

Mistik and L&M compiled yield curves for the FMAs in 2007 during development of the previous FMPs. Descriptions of how these yield curves were developed can be found within the Forest Development document. A summary table (Table 3-1) below demonstrates how the development type was assigned to each forested stand. The net area within each development type and FMA can be found within Table 3-2.

TABLE 3-1: FOREST DEVELOPMENT TYPE ASSIGNMENT

SPECIES GROUP (DT_SPGP)	LEADING SPECIES (DT_SPECIES)	CROWN COVER (DT_CROWN)	PRODUCTIVITY CLASS (DT_PCLASS)	SIGNIFICANT SOFTWOOD (SIG_SOFT)	DEVELOPMENT TYPE (DEVTYPE)	DEVELOPMENT TYPE CODE (DEV_CODE)
S	WS	ALL	ALL	N/A	'S-WS-A-A'	1
S	BS	ALL	ALL	N/A	'S-BS-A-A'	2
S	JP	LD	1	N/A	'S-JP-LD-A-1'	3
S	JP	LD	2	N/A	'S-JP-LD-A-2'	4
S	JP	HD	1	N/A	'S-JP-HD-A-1'	5
S	JP	HD	2	N/A	'S-JP-HD-A-2'	6
S	JP	ALL	ALL	N/A	'S-JP-L&M'	7
SH	JP	ALL	ALL	N/A	'SH-JP-A-A'	8
SH	WS	ALL	ALL	N/A	'SH-WS-A-A'	9
HS	WS	ALL	ALL	N/A	'HS-WS-A-A'	10
HS	JP	ALL	ALL	N/A	'HS-JP-A-A'	11
H	N/A	LD	1	0	'H-A-LD-A-1'	12
H	N/A	LD	2	0	'H-A-LD-A-2'	13
H	N/A	HD	1	0	'H-A-HD-A-1'	14
H	N/A	HD	2	0	'H-A-HD-A-2'	15
H	N/A	LD	ALL	1	'H(S)-A-LD-A'	16
H	N/A	HD	ALL	1	'H(S)-A-HD-A'	17

TABLE 3-2: FOREST DEVELOPMENT TYPE ASSIGNMENT AREA SUMMARY

DEVELOPMENT TYPE CODE	DEVELOPMENT TYPE	MISTIK	L&M
		Area (ha)	
1	'S-WS-A-A'	20,052	2,963
2	'S-BS-A-A'	23,669	10,910
3	'S-JP-LD-A-1'	94,565	0
4	'S-JP-LD-A-2'	29,871	0
5	'S-JP-HD-A-1'	101,108	0
6	'S-JP-HD-A-2'	57,705	0
7	S-JP-L&M'	0	17,962
8	'SH-JP-A-A'	46,711	7,334
9	'SH-WS-A-A'	48,507	3,266
10	'HS-WS-A-A'	50,345	4,033
11	'HS-JP-A-A'	38,209	3,976
12	'H-A-LD-A-1'	16,625	570

DEVELOPMENT TYPE CODE	DEVELOPMENT TYPE	MISTIK	L&M
		Area (ha)	
13	'H-A-LD-A-2'	27,589	1,018
14	'H-A-HD-A-1'	61,877	2,362
15	'H-A-HD-A-2'	124,471	3,546
16	'H(S)-A-LD-A'	29,848	1,257
17	'H(S)-A-HD-A'	46,135	2,028
Total		**817,286**	**61,226**

3.2. UTILIZATION SPECIFICATIONS

The utilization standards used to calculate both softwood and hardwood net merchantable volume are described in detail in the Forest Development document. The utilization parameters for both the Mistik and L&M FMA areas can be found in Table 3-3. There will also be some testing on the impacts of changing the minimum top diameters for softwood. For these tests the utilization standards are found within Table 3-4 and Table 3-5. Following discussion with the companies, Mistik and L&M will be using the 10 cm softwood top utilization for the SMS.

TABLE 3-3: UTILIZATION STANDARDS FOR MISTIK AND L&M

UTILIZATION PARAMETER	L&M Yield Curve # 7		MISTIK + L&M (all other curves)	
	Hardwood	Softwood	Hardwood	Softwood
Stump Height (m)	0.3	0.3	0.3	0.3
Minimum Top Diameter Inside Bark (cm)	8	10	7.5	10
Log Length (m)	**n/a**	**n/a**	2.6	2.6
Merchantable Minimum Bole Length (m)	4.9	5.2	5.2	5.2

TABLE 3-4: CHANGING UTILIZATION STANDARDS FOR CONIFER TO A 7.5CM TOP

UTILIZATION PARAMETER	L&M Yield Curve # 7		MISTIK + L&M (all other curves)	
	Hardwood	Softwood	Hardwood	Softwood
Stump Height (m)	0.3	0.3	0.3	0.3
Minimum Top Diameter Inside Bark (cm)	8	7.5	7.5	7.5
Log Length (m)	**n/a**	**n/a**	2.6	2.6
Merchantable Minimum Bole Length (m)	4.9	5.2	5.2	5.2

TABLE 3-5: CHANGING UTILIZATION STANDARDS FOR CONIFER TO A 12.5CM TOP

UTILIZATION PARAMETER	L&M Yield Curve # 7		MISTIK + L&M (all other curves)	
	Hardwood	Softwood	Hardwood	Softwood
Stump Height (m)	0.3	0.3	0.3	0.3
Minimum Top Diameter Inside Bark (cm)	8	12.5[1]	7.5	12.5
Log Length (m)	**n/a**	**n/a**	2.6	2.6
Merchantable Minimum Bole Length (m)	4.9	5.2	5.2	5.2

[1] *The analysis was completed for a 5" top, which converts to 12.7 cm. However, as discussed with Saskatchewan Government at the August 10, 2017 Planning Team meeting, for consistency with analysis done throughout the province, we have used 12.5cm to label this scenario.*

3.3. CULL DEDUCTIONS

Cull deductions were applied to the yields of each development type to account for scalable defects in the wood volume. These defects include rot, checks, sweep, and crook. In the wood supply analysis, the cull deduction factors used for the Mistik FMA will be 1.5% for softwood and 7.4% for hardwood. The cull factors used for the L&M FMA will be the same except for the jack pine stand yield curve which are 0.4% for softwood and 4.0% for hardwood.

3.4. LONG RUN SUSTAINED YIELD AVERAGE (LRSYA)

Long Run Sustained Yield Average (LRSYA) is a measure of forest productivity and is calculated as the sum of growth per year of regenerated stands at a selected rotation age. It is derived from the theoretical concept of a regulated forest with a static and uniform age class distribution, a single rotation age, and a single yield function operating across equally productive sites. Under this assumption, the annual harvest equates to the annual growth in the selected age class. LRSYA is calculated using the following formula:

$$LRSYA = \sum_{1}^{k} MAI_i \bullet A_i$$

Where:

LRSYA	=	long run sustained yield average (m^3/yr);
MAI_i	=	mean annual increment (m^3/ha/yr) for yield class *i*;
A_i	=	net area (ha) for yield class *i*;
k	=	number of yield strata.

LRSYA estimates are calculated for two scenarios. The first scenario is a “fully stocked” scenario where it is assumed that all stands are on a fully stocked yield curve. This assumption is to address the effect of silviculture by regenerating low density sites after harvest to full stocking. The second scenario is a “status quo” scenario where it is assumed that all stands will transition to their current stocking following harvest.

The LRSYA estimates for a fully stocked and status quo transition assumptions are provided for the Mistik FMA Area in Table 3-6 and Table 3-7 and for the L&M FMA Area in Table 3-8 and Table 3-9.

For the purposes of this Wood Supply Analysis, LRSYA estimates are consistently based off an 80 year rotation age for all development types. The following factors were considered when selecting the rotation age:

- 10 development types, representing 75% of the productive area, have a Mistik Suggested Rotation Age of 80 years (90% of the area is within 1 age class of 80);
- The total area weighted peak MAI is 70 years for all development types. This however was determined by Mistik to be too short considering piece size requirements etc. A rotation age for LRSYA estimates of 80 years is only one age class from the area weighted average peak MAI and more consistent with management objectives.

TABLE 3-6: NET LRSYA ESTIMATES: "FULLY STOCKED" REGENERATION TRANSITION – MISTIK FMA AREA

Development Type	Net Area (ha)	MAI[2] (m^3/ha/yr) @ 80 Years[3]		LRSYA[4] (m^3/yr) @ 80 Years	
		Softwood	Hardwood	Softwood	Hardwood
1 S-WS-A-A	20,053	2.16	0.56	43,250	11,230
2 S-BS-A-A	23,684	0.81	0.16	19,225	3,697
3 S-JP-LD-A-1	94,548	1.06	0.22	99,888	20,389
4 S-JP-LD-A-2	29,871	1.77	0.33	52,945	9,850
5 S-JP-HD-A-1	101,109	1.24	0.22	125,778	22,352
6 S-JP-HD-A-2	57,708	2.25	0.38	129,839	21,980
7 S-JP-L&M	0	0	0	0	0
8 SH-JP-A-A	46,711	1.05	1.18	49,097	54,928
9 SH-WS-A-A	48,515	1.54	1.44	74,832	69,775
10 HS-WS-A-A	50,351	1.10	1.61	55,268	81,187
11 HS-JP-A-A	38,209	0.88	1.48	33,653	56,542
12 H-A-LD-A-1	16,626	0.43	2.08	7,073	34,567
13 H-A-LD-A-2	27,593	0.41	2.52	11,330	69,614
14 H-A-HD-A-1	61,895	0.43	2.08	26,331	128,685
15 H-A-HD-A-2	124,513	0.19	2.81	23,490	350,225
16 H(S)-A-LD-A	29,850	0.98	1.82	29,397	54,210
17 H(S)-A-HD-A	46,147	0.84	1.97	38,908	90,696
Total	**817,383**			**820,304**	**1,079,926**

TABLE 3-7: NET LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – MISTIK FMA AREA

Development Type	Net Area (ha)	MAI[1] (m^3/ha/yr) @ 80 Years		LRSYA[2] (m^3/yr) @ 80 Years	
		Softwood	Hardwood	Softwood	Hardwood
1 S-WS-A-A	20,053	2.16	0.56	43,249	11,225
2 S-BS-A-A	23,684	0.66	0.11	15,686	2,635
3 S-JP-LD-A-1	94,548	0.71	0.12	67,391	11,513
4 S-JP-LD-A-2	29,871	1.25	0.17	37,426	5,041
5 S-JP-HD-A-1	101,109	1.25	0.14	126,234	13,880
6 S-JP-HD-A-2	57,708	2.21	0.31	127,334	18,169
7 S-JP-L&M	0	2.37	0.20	0	0
8 SH-JP-A-A	46,711	1.20	0.98	56,214	45,553
9 SH-WS-A-A	48,515	1.70	1.49	82,266	72,324
10 HS-WS-A-A	50,351	0.70	1.69	35,194	85,272
11 HS-JP-A-A	38,209	0.37	1.38	14,297	52,736
12 H-A-LD-A-1	16,626	0.09	2.22	1,578	36,978
13 H-A-LD-A-2	27,593	0.03	2.58	907	71,079
14 H-A-HD-A-1	61,895	0.09	2.29	5,853	141,904
15 H-A-HD-A-2	124,513	0.08	2.95	9,536	367,113
16 H(S)-A-LD-A	29,850	0.50	1.73	14,988	51,615
17 H(S)-A-HD-A	46,147	0.49	2.34	22,563	107,921
Total	**817,383**			**660,715**	**1,094,956**

[2] MAI includes cull deductions (1.5% Softwood, 7.4% Hardwood).
[3] MAI's for Softwood and Hardwood in the fully stocked are weighted averages based on the transition percentages
[4] Minor differences in LRSYA calculations are a result of rounding.

TABLE 3-8: NET LRSYA ESTIMATES: "FULLY STOCKED" REGENERATION TRANSITION – L&M FMA AREA

Development Type	Net Area (ha)	MAI[1] (m^3/ha/yr) @ 80 Years[2]		LRSYA[3] (m^3/yr) @ 80 Years	
		Softwood	Hardwood	Softwood	Hardwood
1 S-WS-A-A	2,963	2.16	0.56	6,391	1,659
2 S-BS-A-A	10,913	0.81	0.16	8,858	1,703
3 S-JP-LD-A-1	0	1.06	0.22	0	0
4 S-JP-LD-A-2	0	1.77	0.33	0	0
5 S-JP-HD-A-1	0	1.24	0.22	0	0
6 S-JP-HD-A-2	0	2.25	0.38	0	0
7 S-JP-L&M	17,966	2.37	0.20	42,511	3,612
8 SH-JP-A-A	7,335	1.05	1.18	7,709	8,625
9 SH-WS-A-A	3,266	1.54	1.44	5,038	4,697
10 HS-WS-A-A	4,033	1.10	1.61	4,426	6,502
11 HS-JP-A-A	3,976	0.88	1.48	3,502	5,884
12 H-A-LD-A-1	570	0.43	2.08	243	1,186
13 H-A-LD-A-2	1,018	0.41	2.52	418	2,568
14 H-A-HD-A-1	2,362	0.43	2.08	1,005	4,911
15 H-A-HD-A-2	3,546	0.19	2.81	669	9,973
16 H(S)-A-LD-A	1,257	0.98	1.82	1,238	2,282
17 H(S)-A-HD-A	2,028	0.84	1.97	1,710	3,986
Total	**61,233**			**83,718**	**57,590**

TABLE 3-9: NET LRSYA ESTIMATES: "STATUS QUO" REGENERATION TRANSITION – L&M FMA AREA

Development Type	Net Area (ha)	MAI[1] (m^3/ha/yr) @ 80 Years[2]		LRSYA[3] (m^3/yr) @ 80 Years	
		Softwood	Hardwood	Softwood	Hardwood
1 S-WS-A-A	2,963	2.16	0.56	6,391	1,659
2 S-BS-A-A	10,913	0.66	0.11	7,227	1,214
3 S-JP-LD-A-1	0	0.71	0.12	0	0
4 S-JP-LD-A-2	0	1.25	0.17	0	0
5 S-JP-HD-A-1	0	1.25	0.14	0	0
6 S-JP-HD-A-2	0	2.21	0.31	0	0
7 S-JP-L&M	17,966	2.37	0.20	42,511	3,612
8 SH-JP-A-A	7,335	1.20	0.98	8,827	7,153
9 SH-WS-A-A	3,266	1.70	1.49	5,538	4,869
10 HS-WS-A-A	4,033	0.70	1.69	2,819	6,829
11 HS-JP-A-A	3,976	0.37	1.38	1,488	5,488
12 H-A-LD-A-1	570	0.09	2.22	54	1,268
13 H-A-LD-A-2	1,018	0.03	2.58	33	2,622
14 H-A-HD-A-1	2,362	0.09	2.29	223	5,415
15 H-A-HD-A-2	3,546	0.08	2.95	272	10,454
16 H(S)-A-LD-A	1,257	0.50	1.73	631	2,173
17 H(S)-A-HD-A	2,028	0.49	2.34	992	4,743
Total	**61,233**			**77,007**	**57,501**

4. FOREST MANAGEMENT PARAMETERS

4.1. SILVICULTURAL ASSUMPTIONS

There will be no silvicultural assumptions utilized within the Wood Supply Analysis as managed yield curves were not utilized. The SGR transitions are described for each development type in Section 4.3 below.

4.2. OPERABILITY LIMITS – MINIMUM HARVEST AGES

The minimum harvest ages and volumes that will be utilized in the Wood Supply Analysis can be found in Table 4-1 below.

TABLE 4-1: MINIMUM HARVEST AGES AND VOLUMES BY DEVELOPMENT TYPE

DEVELOPMENT TYPE CODE	DEVELOPMENT TYPE	MINIMUM HARVEST AGE	MINIMUM HARVEST VOLUME (m^3/ha)
1	'S-WS-A-A'	100	60
2	'S-BS-A-A'	100	60
3	'S-JP-LD-A-1'	70	60
4	'S-JP-LD-A-2'	70	60
5	'S-JP-HD-A-1'	70	60
6	'S-JP-HD-A-2'	70	60
7	S-JP-L&M'	70	60
8	'SH-JP-A-A'	80	60
9	'SH-WS-A-A'	90	60
10	'HS-WS-A-A'	80	60
11	'HS-JP-A-A'	80	60
12	'H-A-LD-A-1'	70	60
13	'H-A-LD-A-2'	70	60
14	'H-A-HD-A-1'	70	60
15	'H-A-HD-A-2'	70	60
16	'H(S)-A-LD-A'	70	60
17	'H(S)-A-HD-A'	70	60

4.3. TRANSITION RULES

The development type transitions after harvesting are based on the Silvicultural Ground Rules (SGR). For further information regarding the SGR transitions please refer to the SGR document. The transitions for each development type which will be used in the wood supply model can be found in Table 4-2 below.

TABLE 4-2: DEVELOPMENT TYPE TRANSITIONS

DEVELOPMENT TYPE CODE	PRE-HARVEST DEVELOPMENT TYPE	SGR TARGET PERCENT	FUTURE DEVELOPMENT TYPE
1	'S-WS-A-A'	100	1 - 'S-WS-A-A'
2	'S-BS-A-A'	10	1 - 'S-WS-A-A'
		90	2 - 'S-BS-A-A'
3	'S-JP-LD-A-1'	35	3 - 'S-JP-LD-A-1'
		55	5 - 'S-JP-HD-A-1'
		10	8 - 'SH-JP-A-A'
4	'S-JP-LD-A-2'	35	4 - 'S-JP-LD-A-2'
		55	6 - 'S-JP-HD-A-2'
		10	8 - 'SH-JP-A-A'
5	'S-JP-HD-A-1'	90	5 - 'S-JP-HD-A-1'
		10	8 - 'SH-JP-A-A'
6	'S-JP-HD-A-2'	90	6 - 'S-JP-HD-A-2'
		10	8 - 'SH-JP-A-A'
7	S-JP-L&M'	100	7 - 'S-JP-L&M'
8	'SH-JP-A-A'	65	8 - 'SH-JP-A-A'
		10	9 - 'SH-WS-A-A'
		20	11 - 'HS-JP-A-A'
		5	17 - 'H(S)-A-HD-A'
9	'SH-WS-A-A'	10	1 - 'S-WS-A-A'
		70	9 - 'SH-WS-A-A'
		20	10 - 'HS-WS-A-A'
10	'HS-WS-A-A'	40	9 - 'SH-WS-A-A'
		60	10 - 'HS-WS-A-A'
11	'HS-JP-A-A'	20	8 - 'SH-JP-A-A'
		20	9 - 'SH-WS-A-A'
		20	10 - 'HS-WS-A-A'
		30	11 - 'HS-JP-A-A'
		10	17 - 'H(S)-A-HD-A'
12	'H-A-LD-A-1'	15	9 - 'SH-WS-A-A'
		15	10 - 'HS-WS-A-A'
		5	12 - 'H-A-LD-A-1'
		65	14 - 'H-A-HD-A-1'
13	'H-A-LD-A-2'	15	9 - 'SH-WS-A-A'
		15	10 - 'HS-WS-A-A'
		5	13 - 'H-A-LD-A-2'
		65	15 - 'H-A-HD-A-2'
14	'H-A-HD-A-1'	15	9 - 'SH-WS-A-A'
		15	10 - 'HS-WS-A-A'
		5	12 - 'H-A-LD-A-1'
		65	14 - 'H-A-HD-A-1'
15	'H-A-HD-A-2'	5	9 - 'SH-WS-A-A'
		5	10 - 'HS-WS-A-A'
		90	15 - 'H-A-HD-A-2'
16	'H(S)-A-LD-A'	35	9 - 'SH-WS-A-A'
		35	10 - 'HS-WS-A-A'
		30	17 - 'H(S)-A-HD-A'
17	'H(S)-A-HD-A'	25	9 - 'SH-WS-A-A'
		25	10 - 'HS-WS-A-A'

DEVELOPMENT TYPE CODE	PRE-HARVEST DEVELOPMENT TYPE	SGR TARGET PERCENT	FUTURE DEVELOPMENT TYPE
		50	17 - 'H(S)-A-HD-A'

4.4. FOREST STAND BREAK-UP AGES

The yield curves were generated based on empirical data and the volumes start to decline at varying points in time based on the differing development types. Within the Wood Supply Analysis there was a “death-age” set at 400 years to ensure that no stand will be older than 400 years.

4.4.1. SENSITIVITY ANALYSIS

There was a sensitivity analysis completed for the break-up ages based on two times the rotation age for each development type. The rotation age is the point where the mean annual increment (MAI) intersects with the periodic annual increment (PAI) or where the slope of the MAI is equal to zero. In certain development types the rotation age was less than the minimum harvest age. In the cases where the rotation age was less than the minimum harvest age the minimum harvest age was used as the rotation age. Table 4-3 below displays the rotation and break-up ages for each development time that were utilized in the sensitivity analysis.

TABLE 4-3: DEVELOPMENT TYPE ROTATION AND BREAK-UP AGES

DEVELOPMENT TYPE CODE	DEVELOPMENT TYPE	ROTATION AGE	BREAK-UP AGE[5]
0	‘non-net landbase eligible exclusions’	N/A	200
1	'S-WS-A-A'	100	200
2	'S-BS-A-A'	100	200
3	'S-JP-LD-A-1'	80	160
4	'S-JP-LD-A-2'	85	170
5	'S-JP-HD-A-1'	75	150
6	'S-JP-HD-A-2'	70	140
7	S-JP-L&M'	70	140
8	'SH-JP-A-A'	80	160
9	'SH-WS-A-A'	90	180
10	'HS-WS-A-A'	80	160
11	'HS-JP-A-A'	80	160
12	'H-A-LD-A-1'	75	150
13	'H-A-LD-A-2'	75	150
14	'H-A-HD-A-1'	75	150
15	'H-A-HD-A-2'	70	140

[5] *For some of the development types the break-up age was required to be older as there was already area within the landbase that was older than the break-up age at the onset of the modelling.*

16	'H(S)-A-LD-A'	70	140
17	'H(S)-A-HD-A'	70	140

4.4.2. RE-PLANNING THRESHOLD

For this FMP, consistent with Mistik's 2007 20-Year FMP, a re-planning threshold of 10% net area will be in place.

5. NON-TIMBER OJECTIVES

5.1. VALUES, OBJECTIVES, INDICATORS, AND TARGETS (VOITS)

There are multiple VOITs that have been established for the Mistik and L&M FMAs through the planning process. As there are many VOITs that are not affected by the WSA only the VOITs affected by the WSA will be briefly described. For further description of all of the VOITs please refer to the VOITs document. The VOITs that will be included within the WSA are the spatial and temporal VOITs that are affected by the harvest patterns on the landscape.

5.1.1. OLD AND VERY OLD SERAL STAGE RETENTION TARGETS

The seral stage VOITs are affected by the harvest patterns on the landscape and therefore it is necessary to include them in the wood supply modeling. The two main seral stage VOITs that will be included within the model are VOITs 1.1.1.1 (2a) and 1.1.1.1 (2b). These VOITs maintain specific targeted area of old and very old forested area. The current proposed targets for these two VOITs are briefly described in Table 5-1 and Table 5-2 below. These targets vary from the targets presented in the FMP draft planning standard (2017). They were developed during the 2007 FMP using Dr. David Andison's "Pre-Industrial Forest Condition Analysis" (Andison, 2007). This study quantified the natural range of variation for the FMA to assign targets for various natural patterns (including seral stage) across the FMA.

TABLE 5-1: SERAL STAGE AGE RANGES BY SGR TYPE

SGR TYPE	AGE RANGE	
	Old Forest (VOIT 1.1.1.1 2a)	Very Old Forest (VOIT 1.1.1.1 2b)
S-BS	>100 yrs	>120 yrs
S-JP	>100 yrs	>120 yrs
S-WS	>100 yrs	>120 yrs
SH Mixedwoods	>100 yrs	>120 yrs
HS Mixedwoods	>90 yrs	>120 yrs
H	>90 yrs	>120 yrs

TABLE 5-2: SERAL STAGE TARGETS BY SGR TYPE

SGR TYPE	TARGET (%)	
	Old Forest (VOIT 1.1.1.1 2a)	Very Old Forest (VOIT 1.1.1.1 2b)
S-BS	≥5%	≥0.5%
S-JP	≥5%	≥0.5%
S-WS	≥9%	≥0.9%
SH and HS Mixedwoods	≥10%	≥1%
H	≥14%	≥1.4%

5.1.2. IN-BLOCK RETENTION

As the retention is being applied as an HVS adjustment it is not necessary to address it within the model. The final modelled HVS for softwood and hardwood in both the Mistik and L&M FMAs will be reduced by 4% to account for the insular retention target. For further details on the post-harvest retention target, please refer to Indicator #4 in the VOITs document.

5.1.3. EVENT SIZE

The target for the harvest event size class distribution for the FMP is that over the next 10 years, at least 25% of all harvested areas will create disturbance events at least 1,000 ha in size. This target was developed using Dr. David Andison's "Pre-Industrial Forest Condition Analysis" (Andison, 2007). The study developed the targets using the natural range of variation for the FMA area. As the process for determining the event and overall event size is dependent on GIS processing it is not controlled within the wood supply model.

5.1.4. OLD FOREST PATCH SIZE

Similar to event size the old forest patch size target was developed using Dr. David Andison's "Pre-Industrial Forest Condition Analysis" (Andison, 2007). There are three targets for old forest patch size based on the Andison analysis. These targets include:

1. Large Old forest Patches:
    a. Increase the number of old forest patches larger than 500 ha on the Mistik FMA from two to three over the next 10 years.
2. Small Old forest Patches:
    a. Maintain the proportion of old forest area in patches smaller than 50 ha between 60-75% over the next ten years.
3. Operable forest in Large Old forest Patches:
    a. For the next 10 years, the proportion of operable forest in each of the five largest old forest patches shall not be less than 20%.

As the process for determining the old forest patches is dependent on GIS processing it is not controlled within the wood supply model.

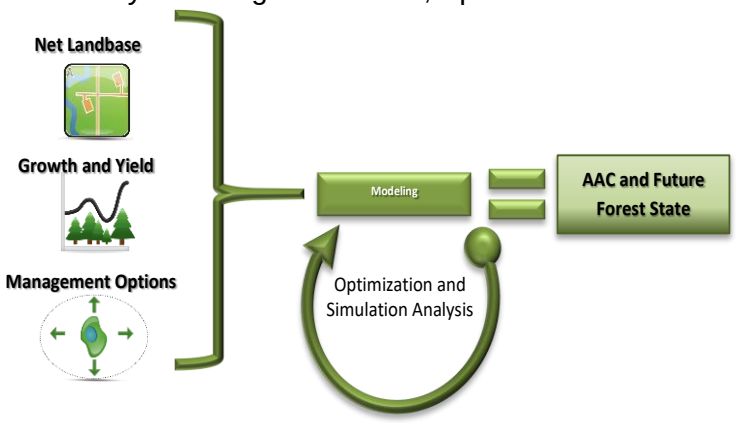
5.1.5. WOODLAND CARIBOU

There are multiple VOITs related to caribou that have been established for the FMAs. It is not possible to include some of these VOITs in the model as they are dependent on GIS processing. One of the targets that will be utilized within the model is the total harvested area within the caribou ranges. Within a ten year period, the total area harvested within all woodland caribou ranges will not exceed 3% of the gross forested area within all woodland caribou ranges. It should be noted that the caribou ranges used will be the same as the 2007 FMP.

6. WOOD SUPPLY MODEL

6.1. MODELING SOFTWARE - WOODSTOCK™

Various forest management scenarios (FMS) will be analyzed using Remosoft®, Spatial Planning System (RSPS) or formerly known as Woodstock™ (version 2016.06). For this WSA, aspatial modelling scenarios will be completed in RSPS as optimization formulas with one objective function (e.g. maximize total volume, maximize conifer volume, etc.). Other constraints will be placed on the model in order to achieve the desired future forest. The resulting linear programming matrix (aspatial solution) created by RSPS will be solved using MOSEK, an interior point LP solver (version 7.0.).



The model simulates the effect of management strategies on sustainable harvest levels over a specified planning horizon. In its most basic form, RSPS is a model which cuts and grows each stand in the forest, according to user-defined yield functions and forest policy constraints. Operating unit sequencing can also be introduced to reflect “real-world” limitations, such as accessibility and multi-pass harvesting rules.

As the model is aspatial, it is necessary to create a spatial link to the planning layer for the planning horizon. Therefore, the aspatial solution generated in Woodstock will be run through Remsoft’s Spatial Optimizer (formerly known as STANLEY). The Spatial Optimizer uses the solution and the spatial planning layer (shapefile) within Woodstock to make the solution spatial. Within the Spatial Optimizer, the user is able to apply adjacency or proximity constraints, green-up delays, etc. in order to:

- Control the distribution (or concentration) of the harvest, and;
- Mimic operational planning strategies.

6.1.1. WOOD SUPPLY MODEL PARAMETERS

Woodstock™ is comprised of several “sections” which are used to setup the parameters for the wood supply. The following sections will be described below.

6.1.1.1. BASIC PARAMETERS

The following standard assumptions will be used within all of the FMS in the WSA:

- 200 year planning horizon (40 five year periods = 200 years)
- Yield Curves described in Section 3.1
- Development type transitions described in Section 4.3

- Minimum harvest ages described in Section 4.2 (Operability limits)
- Cull deductions described in Section 3.2

TABLE 6-1: HARVEST SIMULATION CONTROL PARAMETER DEFINITIONS USED IN ANALYSIS

PARAMETER	DEFINITION
Objective:	Description of the objective function utilized in the scenario
Model constraints:	Total time period for the analysis scenario (years)
Effective date:	The effective date of the landbase (i.e. the year the latest updates were made)
Harvest unit:	Description of the area(s) included within the specific scenario
Planning horizon:	Total time period for the analysis scenario (years)
Targeted average harvest age at the end of the planning horizon:	Average age (years) of stands scheduled for harvest in the last twenty years of the planning horizon, typically with a specified tolerance
Minimum harvest age:	Minimum age (years) of stands that are eligible for harvest scheduling; may vary by yield stratum[6]
Landbase:	Landbase available for analysis
Yield curves:	Predicted yields for individual strata
Cull deductions:	Percent reduction of predicted yields to account for losses from defects
Regeneration transition:	Assumptions applied for the regeneration of stands scheduled for harvest[7]
Regeneration lag:	Assumed time period for the establishment of regeneration after harvest
Introduce harvest plans:	Incorporation of existing harvest plans into the harvest sequence

6.1.1.2. LANDSCAPE SECTION

The landscape section of the wood supply model identifies the defining attributes used for the landbase. In Woodstock these defining attributes are referred to as “THEMES”. Currently there are six themes in the wood supply model. Within each theme it is also possible to further group attributes with the use of “AGGREGATE”. The six themes currently in the wood supply model along with their descriptions can be found in the following tables Table 6-2 through Table 6-8)

As the WSA is currently in progress and an AAC determination strategy has yet to be determined the number of themes and their codes may change.

6.1.1.3. THEME 1 – DEVELOPMENT TYPE

The Development Type theme includes all 17 development types described above in Section 3.1. This theme along with the age assigns the yield information (hardwood and softwood volume) to the area under each combination of age and development type. Table 6-2 displays the codes and descriptions for the development types within Theme 1.

[6] *Appendix B – Rotation Age Analysis*
[7] *Appendix C – Mistik FMA Area Development Type Transitions*

TABLE 6-2: THEME 1 DESCRIPTION

THEME 1 VALUE	DEVELOPMENT TYPE
DT1	'S-WS-A-A'
DT2	'S-BS-A-A'
DT3	'S-JP-LD-A-1'
DT4	'S-JP-LD-A-2'
DT5	'S-JP-HD-A-1'
DT6	'S-JP-HD-A-2'
DT7	S-JP-L&M'
DT8	'SH-JP-A-A'
DT9	'SH-WS-A-A'
DT10	'HS-WS-A-A'
DT11	'HS-JP-A-A'
DT12	'H-A-LD-A-1'
DT13	'H-A-LD-A-2'
DT14	'H-A-HD-A-1'
DT15	'H-A-HD-A-2'
DT16	'H(S)-A-LD-A'
DT17	'H(S)-A-HD-A'

6.1.1.4. THEME 2 – WOOD SUPPLY AREA

The Wood Supply Area theme identifies the FMA area that the landbase is within. The codes within this theme can be found in Table 6-3 below.

TABLE 6-3: THEME 2 DESCRIPTION

THEME 2 VALUE	DESCRIPTION
Mistik	Mistik FMA
LM	L&M FMA

6.1.1.5. THEME 3 – MANAGEMENT UNIT

The Management Unit theme identifies the management units throughout the landbase. The management units will be used for reporting purposes within the wood supply analysis. The management units have also been aggregated into larger planning units for reporting purposes. For the codes and their descriptions please refer to Table 6-4 below.

TABLE 6-4: THEME 3 DESCRIPTION

THEME 3 VALUE	MANAGEMENT UNIT	PLANNING UNIT
1	Divide	Divide
2	Pierceland	West
3	Big Island Lake	West
4	Waterhen	Central
7	Beauval	Central
8	Canoe Lake	Central
9	Ile a-la-Crosse	Central
10	Buffalo Narrows	Central
11	Dillon	North
12	Murray Bay	West
20	Beaver River	West
21	Peter Pond	North
85	L & M	L & M

6.1.1.6. THEME 4 – OPERATING AREA

The Operating Area theme identifies the operating areas throughout the landbase. Similar to the management unit theme they will be used for reporting purposes within the WSA. The theme codes and descriptions can be found in Table 6-5 below.

TABLE 6-5: THEME 4 DESCRIPTION

THEME 4 VALUE	OPERATING AREA	THEME 4 CODE	OPERATING AREA	THEME 4 CODE	OPERATING AREA
01-010	Horseneck	07-022	Ingleby	11-041	Chedister Headwater
01-011	Alcott Creek	07-023	Gallant East	11-042	Cherpeta Headwater
01-012	Burner North	07-024	Beauval Forks	11-043	False Cherpeta
01-013	Hunting Lake South	07-025	Lac LaPlonge	11-044	Nipin Forks
01-014	Hunting Lake North	07-026	Lac LaPlonge West	11-045	Rodss Trail
01-015	Hanley	07-027	Beauval East	11-046	Billette lake
01-016	Mikinak Lake	07-028	Wilson Creek West	11-047	Watapi East
01-017	Scorcher West	07-029	Wilson Creek	11-048	Eagle Nest
01-018	Scorcher South	07-030	Wilson Creek East	11-049	Marten
01-019	Triangle North	07-031	Dore Lake North	11-050	Swamp Only
01-020	Aspen East	07-032	Wilson Creek South	11-051	Watapi River
01-021	Burness South	07-033	Dore River	11-052	Split Creeks
01-022	Burness East	07-034	Dore River West	11-053	South Lockwood
01-023	Triangle South	07-035	Dore River East	11-054	Tween Creeks
01-024	Burness West	07-036	Dore River South	11-055	Watapi Eskers
01-026	Old Scorcher North	07-037	Dore Lake West	11-056	Taskam Creek
01-027	Scorcher	07-038	Dore Lake	11-057	Neath Esker
01-028	Lavigne River West	07-039	Hillyer Lake West	11-058	Neath Creek

THEME 4 VALUE	OPERATING AREA	THEME 4 CODE	OPERATING AREA	THEME 4 CODE	OPERATING AREA
01-029	Thickwood	07-040	Dore Lake West Burn	11-059	Neath North
01-030	Winterwood	07-041	Lenard Fire	11-060	Border
01-031	Dinnaken	07-042	Lac LaPlonge South	11-061	Chandra
01-032	Lavalle	08-005	Canoe Lake West	11-062	Clatto Creek
01-033	Moosehead	08-006	Wiggins Bay	11-063	Ribbon Lakes
01-034	Burner	08-007	Whitefish Lake	11-064	Gray Lake
01-035	Sundance	08-008	Keeley Portage	11-065	Gray Creek
01-036	Alcott Creek East	08-009	Keeley Lake North	11-066	Bison
01-037	Old Scorcher South	08-010	Keeley Lake	11-067	Manny West
01-038	Hwy 304	08-011	Booth Bay	11-068	Rainbow
01-039	Boil Hills	08-012	Arsenault Lake	11-069	Three Bears
01-040	Rat Lake West	08-013	Apps Creek	11-070	Rosemary
01-041	Rat Lake South	08-014	McCusker River	11-071	Manny East
01-042	Lavigne River East	08-015	McCallum Lake	11-072	Lonely Lake
01-043	Dinnaken North	08-016	Booth Bay Road	11-073	Chickadee
01-044	Meadowland	08-017	Hazel Lake	11-074	Winter
01-045	Boundary East	08-018	Pringle Lake	11-075	Jack
01-046	Sulby Creek North	08-019	Keeley River Crossing	11-076	Do Dee
01-047	Sulby Creek South	08-020	Amyot Lake West	11-077	Blue Timber
01-048	Four-Mile Creek	08-021	Canoe Lake East	11-078	Lessard Headwaters
01-049	Moose Country	08-022	Canoe Lake North	11-079	Lockwood
01-050	Nelson	08-023	Apps Fire South	11-080	Chain
01-051	Thickwood West	08-024	Grubb Lake Burn	11-081	Lessard Creek
01-052	Thickwood South	08-025	Grubb Lake	11-082	Dillon South
01-053	Winterwood East	08-026	Parker Lake	11-083	Arrowhead
01-054	Horseneck East	08-027	Apps Stockpile	11-084	Millenium
01-055	Mikinak Lake West	08-028	McCusker River South	11-085	Coyote
02-006	Highway 919 West	08-029	McCusker River Burn	11-086	Seismic
02-007	Pipeline	08-030	Durocher Lake West	11-087	Forteen Lakes
02-009	Five Creeks	08-031	Keeley Lake West	11-088	McAlister East
02-010	Martineau South	08-032	Keeley Portage East	11-089	McAlister Creek
02-011	Cold Lake	08-033	Durocher Lake South	11-090	Denya
02-012	Highway 919 East	09-001	Reid Bay	11-091	White Wolf
02-013	Tatukose Lake North	09-003	McFarlane	11-092	Seismic Junction
02-014	Tatukose Lake	09-004	Big Ridge	11-093	Black Beaver
02-016	Gold Creek	09-005	Kazan River	11-094	Overflow
02-017	Porcupine Lake	09-006	Kazan Peninsula	11-095	Crane

THEME 4 VALUE	OPERATING AREA	THEME 4 CODE	OPERATING AREA	THEME 4 CODE	OPERATING AREA
02-019	Martineau East	09-008	Beaver Creek	11-096	Black Bear
02-020	Martineau West	09-009	Two Points	11-097	Barney Creek
02-022	Middle Creek	09-012	Shaw Bay	11-098	Bullet
02-023	Muskeg Island Lake	09-014	Walton Bay	11-099	Wayne
02-024	Sukaw Lake	09-016	Hornoi Bay	11-100	McAlister Lake
02-025	Dakin Lake	09-020	Watchusk Bay	11-101	McAlister South
02-026	Tukayaw	09-024	Rosser East	11-102	Fly-in
02-027	Charlton Lake	09-025	Town	11-103	Manny Lake
02-028	Poplar Ridge	09-026	Rosser West	11-104	Panther
02-029	Jukes Lake	09-029	Ile-x Lowland	11-105	Armstrong Creek
02-030	Edwards Lake	09-030	Apps Corner	11-106	Manny Creek
02-032	Maynard	09-033	Canoe Junction	11-107	Armstrong North
02-033	Gabes	09-035	Pasture	11-108	Clatto Junction
02-034	Twin Lakes	09-042	Big Amyot	11-109	Briant Creek
02-035	Grad and Walker	09-045	Cabin Bay	11-110	20th Base
02-036	Muskeg River	09-047	Little Amyot	11-111	Beaver Lake
02-037	Romanchuk	09-051	South Bay	11-112	Sleepy Hollow
02-038	Muskeg Lake North	09-052	Island Lakes	11-113	Kagney
02-039	Muskeg Lake South	09-054	Beaver Narrows	11-114	Trout
02-041	Green Grass Lake	09-057	Fort Black	11-115	Stork
02-043	Sekip Lake	09-058	Ile-Aux-Trembles	11-116	Tall Timber
03-002	Mistohay Tower	09-060	Sawmill Bay	11-117	Done
03-003	de Balinard	10-001	Far Side	12-008	Forked Creek
03-004	Gold Lake	10-004	Peter Puddle	12-009	Mallard West
03-005	Yamaha Lake	10-006	White Fish	12-010	Kukuka Lake
03-007	Fox Lake Tower	10-007	Spoule	12-011	Bent Creek
03-008	Fox Lake	10-010	Swamp Island	12-012	Twin Creeks
03-010	9 Mile Pine	10-011	Niska Lake	12-013	Gravel Ridge
03-011	Bear Creek	10-012	Upper Cummins	12-014	Dennis Creek
04-001	Ratt Lake North	10-013	Niska Channel	12-015	Dennis Creek South
04-002	Ratt Lake	10-014	Niska Point	12-016	Baseline
04-003	Ratt Lake South	10-015	Niska South	12-017	Horseshoe Lake
04-004	Seigun Lake	10-017	Jeannotte Lake	12-018	Pipe Lake
04-005	Boire Lake	10-018	Clapsons	12-019	Coupland Lake
04-006	Jackfish	10-019	Telegraph	12-020	Lost Lake South
04-007	Pagen Lake	10-021	Martin River	12-021	Trask Lake
04-008	Cassidy Lake	10-022	McMahan Lake	12-022	Carl Creek
04-009	Redmond Lake	10-023	Kazan Portage	12-023	Taylor Creek

THEME 4 VALUE	OPERATING AREA	THEME 4 CODE	OPERATING AREA	THEME 4 CODE	OPERATING AREA
04-010	Mallard Lake	10-024	Brynn	20-001	Beaver River Highway 55
04-011	Watt Lake	10-028	Gravel Quarry	20-002	Eaton Lake
04-012	Stewart Lake	10-029	Francois	20-003	Parkland
04-013	Waterhen South	10-030	Weasel	20-004	Woodland Lake
04-014	Waterhen East	10-032	Esker	21-001	Old Treaty Grounds
04-015	Shallow Lake	10-034	Eadie Lake	21-002	High Ridge
04-016	Wiggins Bay	10-036	Cumins Creek	21-003	Tower
04-017	Jumbo North	10-039	Montgrand	21-004	Williams Creek South
04-018	Bear Rock	10-042	Lost Trail	21-005	Dillon River
04-019	Hay/Shallow Lake	10-043	Two Mills	21-006	Little Dillon Lake
04-020	Ingleby Lake	10-045	McCusker Valley	21-007	Dillon Lake
04-021	Lucky Lake	10-046	Angus Meadow	21-008	Grizzly Divide
04-022	Minnow Lake	10-049	Watershed	21-009	Martin Creek South
04-023	Waterhen Cut-Across	11-002	Old Fort Point	21-010	Williams Creek North
04-024	Park Cut-Across	11-003	Buckleys Road	21-011	Martin Creek North
04-025	Musk Creek	11-006	St. Georges Jct.	21-012	Grizzly Bear Hills
04-026	Hay Creek Burn	11-007	Little Meadow	21-013	Barney Lake
04-027	Devils Creek	11-008	Vermette East	21-014	Buffalo Hills South
04-028	Bull Creek	11-009	Eadie Lake East	21-015	Thousand Creeks East
04-029	Birch Lake	11-010	Nipin River	21-016	Buffalo Hills North
04-030	Stewart Lake East	11-011	Little Point	21-017	Michel
04-031	Stewart Lake South	11-012	Dinner North	21-018	Headquarters
04-032	Stewart Lake West	11-013	Dinner	21-019	Radar Road
04-033	Minnow Lake East	11-014	Round Lake	21-020	Brown Creek East
04-034	Sandy Meadow	11-016	Cherpeta	21-021	Kimowin River
04-035	Long Lake	11-017	Nipin East	21-022	Bull
04-036	Fern Lake	11-018	Cumins Brook	21-023	Dillon River Junction
04-037	Jumbo Lake	11-019	Felix	21-024	Maclean Rapids North
04-038	Hawryluk Creek	11-020	Sylvestre	21-025	Maclean Rapids South
04-039	Low Creek	11-021	Cut Across	21-026	Graham Lake
04-040	Broad Creek	11-022	Horse Trail	21-027	Hourglass
04-041	Low Creek West	11-023	River Ridge	21-028	21st Baseline
04-042	Spruce Creek	11-024	Nipin Junction	21-029	Thousand Creeks West
04-043	Salt Creek	11-025	Vermette Creek	21-030	Brown Creek West
04-044	Mallard Lake Burn	11-026	Cumins Basin	21-031	Brown Lake
04-045	Last Lake	11-027	Red Sucker Creek	21-032	McAdam Lake

THEME 4 VALUE	OPERATING AREA	THEME 4 CODE	OPERATING AREA	THEME 4 CODE	OPERATING AREA
07-009	Aubichon North	11-028	Angus Creek Forks	21-033	Finlay Lake South
07-010	Gallant Lake	11-029	Range Corner	21-034	Radar Site 44
07-011	Gallant North	11-030	Clifford	21-035	Finlay Lake North
07-012	Durocher Lake	11-031	Cherpeta Lake	85-001	Divide West
07-013	Athabasca Mill	11-032	Three Creeks	85-002	Divide North
07-014	Beauval South	11-033	Kelsey	85-003	Divide East
07-015	Beauval Mistletoe	11-034	Chedister Creek	85-004	Divide South
07-016	Beauval North	11-035	Nipin Mouth	85-005	Lavigne
07-017	Fort Black South	11-036	Vermette Mountains	85-006	Helene North
07-018	Pringle Lake	11-037	Dinner Lowland	85-007	Helene Central
07-019	Beauval Pastures	11-038	Chedister West	85-008	Helene South
07-020	Durocher Lake South	11-039	Chedister Lowland	85-009	Helene West
07-021	Rude Lake	11-040	Fisher	85-010	Helene

6.1.1.7. THEME 5 – SGR TYPE

The SGR Type theme identifies the SGR type for each record in the current landbase. The theme codes and descriptions can be found in Table 6-6 below.

TABLE 6-6: THEME 5 DESCRIPTION

THEME 5 VALUE	DESCRIPTION
H	Hardwood
HS-JP	Hardwood leading Jack Pine Mixedwood
HS-WS	Hardwood leading White Spruce Mixedwood
S-BS	Black Spruce Softwood
S-JP	Jack Pine Softwood
S-WS	White Spruce Softwood
SH-JP	Softwood leading Jack Pine Mixedwood
SH-WS	Softwood leading White Spruce Mixedwood

6.1.1.8. THEME 6 – CARIBOU RANGE

The Caribou Range theme identifies the area within the current landbase that is within the caribou range. The theme codes and descriptions can be found in Table 6-8 below.

TABLE 6-7: THEME 6 DESCRIPTION

THEME 6 VALUE	DESCRIPTION
C0	Outside of the Caribou Range
C1	Inside the Caribou Range

6.1.1.9. THEME 7 – TACTICAL PLAN

The tactical plan theme identifies the area within the current landbase that has been identified as within the tactical plan. The theme codes and descriptions can be found in Table 6-8 below.

TABLE 6-8: THEME 7 DESCRIPTION

THEME 7 VALUE	DESCRIPTION
OF	Area not available for harvest in the first 20 years
T1	Area available for harvest within the first 10 years (first priority blocks)
T2	Area available for harvest within the first 20 years (second priority blocks)

6.1.1.10. OPTIMIZE SECTION

The optimize section of the wood supply model controls the modeled objective function and constraints. The objective function can be set to minimize or maximize any specified output. In wood supply analyses, it is most common to maximize the wood volume over the planning horizon. Constraints within the optimize section identify bounds in which the model cannot exceed or go below related to timber or non-timber values. Some commonly used constraints include even flow harvested volumes throughout the planning horizon and non-declining operable growing stock for the last quarter of the planning horizon.

6.1.2. SCENARIOS

There will be multiple scenarios explored during the WSA in order to achieve an AAC determination strategy. The following scenarios in Table 6-9 will be completed to serve as a foundation/baseline and further scenarios will be finalized based on discussions with Mistik, L&M, and government.

TABLE 6-9: FOREST MANAGEMENT SCENARIOS (FMS) EXPLORED

FMS #	Objective Function	Minimum Harvest Age	Transitions	Even Flow	NDY (last 50 yrs)	Tactical Plan Incorporated	Seral Stage	Spatial Constraints
1	Maximize Total Volume	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	NO	NO
2	Maximize Hardwood Volume	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	NO	NO
3	Maximize Softwood Volume	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	NO	NO

FMS #	Objective Function	Minimum Harvest Age	Transitions	Even Flow	NDY (last 50 yrs)	Tactical Plan Incorporated	Seral Stage	Spatial Constraints
4	Maximize Total Volume w/ Seral Stage Constraints	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	YES	NO
5	Maximize Softwood Volume w/ Seral Stage Constraints	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	YES	NO
6	Maximize Hardwood Volume w/ Seral Stage Constraints	100 Years- Black and White Spruce Softwood 70 Years- Jack Pine Softwood 80 Years- Jack Pine Leading Softwood Mixedwood (SH) 90 Years- Spruce Leading Softwood Mixedwood (SH) 80 Years- Jack Pine and Spruce Deciduous Mixedwood (HS) 70 Years- Hardwood	SGR Transitions	YES	YES	NO	YES	NO

7. REFERENCES

Andison, David. 2007. Pre-Industrial Forest Condition Analysis and Integration of Natural Disturbance Patterns on the Mistik Management Ltd. FMA Area in Saskatchewan.